# Appendix A

# Air Quality Conformity Analysis

# Conformity Analysis Report and Conformity Determination For The Greensboro Urban Area 2030 Long Range Transportation Plan

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Prepared by:
The North Carolina Department of Transportation
Transportation Planning Branch

In Cooperation with:
The Greensboro Urban Area Metropolitan Planning Organization
and

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# Greensboro Urban Area Conformity Analysis Report



## Executive Summary

The purpose of this report is to comply with the provisions of the Clean Air Act Amendments of 1990 and the Transportation Equity Act for the 21st Century. It demonstrates that the fiscally constrained long-range transportation plan of the Greensboro Urban Area Metropolitan Planning Organization eliminates or reduces violations of the national ambient air quality standards (NAAQS) in Guilford County. The plan accomplishes the intent of the North Carolina State Implementation Plan (SIP). This conformity determination is based on a regional emissions analysis that uses the transportation network approved by the Greensboro Urban Area for the 2030 Transportation Plan and the emissions factors developed by the North Carolina Department of Environment and Natural Resources (DENR). Based on this analysis, the Greensboro Urban Area Transportation plan conforms to the purpose of the North Carolina SIP.

Guilford County was originally declared non-attainment for ozone ($O_3$) on January 6, 1992. At that time, Guilford County was classified as moderate nonattainment for ozone. On November 8, 1993 Guilford County was redesignated to maintenance for ozone.

The conformity determination is based on the Greensboro Urban Area long range transportation plan. The transportation plan is analyzed for 2004, 2014, 2020 and 2030. Each analysis year includes expected population and employment data and roadway and transit projects that should be open. The plan is fiscally-constrained and funding sources are identified to the extent possible. Table 1 summarizes the conformity requirements of 40 CFR Part 51 and 93 and gives the status of the Greensboro Urban Area long range transportation plan in relation to each of these requirements.

### Table 1: Summary of Status of Conformity Requirements

| Criteria | Plan Meets | Plan Does Not Meet |
|---|---|---|
| Consistent with Emissions Budget(s) | √ | |
| TCM Implementation[1] | n/a | |
| Interagency Consultation | √ | |
| Latest Emissions Model | √ | |
| Latest Planning Assumptions | √ | |
| Fiscal Constraint | √ | |

DENR prepared base and future emission rates for the vehicle fleet using Mobile 6.2. These rates were applied to VMT from the Greensboro Urban Area travel demand model. Table 2 in this section is a summary of the emissions budget comparison.

[1] The NC SIP includes no TCMs related to this MPO.

**Table 2:**

**a) Emissions Comparison Summary**

| Guilford County Emissions Comparison (kg/day)[1] | | | | |
|---|---|---|---|---|
| | $NO_X$ | | VOC | |
| Year | SIP Emissions (KG/Day) | Long Range Plan Emissions (KG/Day) | SIP Emissions (KG/Day) | Long Range Plan Emissions (KG/Day) |
| **2004(Old SIP)** | 37,430 | 29,310 | 22,290 | 17,434 |
| **2004** | 30,871 | 29,202 | 18,334 | 16,737 |
| 2007 | 24,748 | 22,740 | 15,921 | 13,890 |
| **2010** | 18,243 | 16,277 | 12,991 | 11,044 |
| 2012 | 14,914 | 13,404 | 11,884 | 9,819 |
| **2014** | 14,914 | 10,531 | 11,884 | 8,594 |
| 2015 | 11,050 | 9,874 | 10,578 | 8,273 |
| **2020** | 11,050 | 6,593 | 10,578 | 6,668 |
| **2030** | 11,050 | 5,047 | 10,578 | 5,700 |

**b) Emissions Comparison Summary**

| Entire Davidson County Emissions Comparison (kg/day) | | | | |
|---|---|---|---|---|
| | $NO_X$ | | VOC | |
| Year | SIP Emissions (KG/Day) | Long Range Plan Emissions (KG/Day) | SIP Emissions (KG/Day) | Long Range Plan Emissions (KG/Day) |
| **2004(Old SIP)** | 11,104 | 8,640 | 7,321 | 4,524 |
| **2004** | 11,594 | 8,649 | 5,888 | 4,385 |
| 2007 | 9,516 | 6,775 | 5,234 | 3,592 |
| **2010** | 7,067 | 4,901 | 4,291 | 2,798 |
| 2012 | 5,770 | 4,018 | 3,973 | 2,511 |
| **2014** | 5,770 | 3,136 | 3,973 | 2,224 |
| 2015 | 4,282 | 2,915 | 3,574 | 2,137 |
| **2020** | 4,282 | 1,810 | 3,574 | 1,701 |
| **2030** | 4,282 | 1,297 | 3,574 | 1,486 |

[1] To obtain tons per day divide kilograms per day by 907.18474

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# Conformity Determination and Analysis for Greensboro Urban Area 2030 Long Range Transportation Plan

## 1. Introduction

The purpose of this report is to comply with the provisions of the Clean Air Act Amendments of 1990 (CAAA) and the Transportation Equity Act for the 21st Century. It demonstrates that the fiscally-constrained long range transportation plan for the Greensboro Urban Area (Greensboro Urban Area) Metropolitan Planning Organization eliminates or reduces violations of the national ambient air quality standards (NAAQS) in Guilford County and accomplishes the intent of the North Carolina State Implementation Plan (SIP). This conformity determination is based on a regional emissions analysis that uses the transportation network approved by the Greensboro Urban Area for the 2030 Transportation Plan and the emissions factors developed by the North Carolina Department of Environment and Natural Resources (DENR). All Federally funded projects in the areas designated by the United States Environmental Protection Agency (USEPA) as air quality non-attainment or maintenance areas must come from a conforming long range transportation plan and transportation improvement program (TIP). In addition, the United States Department of Transportation (USDOT), specifically, the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA), must make a conformity determination on the MPO Plan and the TIP in all non-attainment and maintenance areas.

In order to assist the Greensboro MPO in making a conformity determination on the adopted 2030 fiscally constrained long range transportation plan, the Transportation Planning Branch of the North Carolina Department of Transportation (NCDOT) performed a systems level conformity analysis of the 2030 transportation plan. This analysis is consistent with the third set of amendments to 40 CFR Parts 51 and 93, *Transportation Conformity Rule Amendments: Flexibility and Streamlining; Final Rule*, effective on September 15, 1997. **Based on the regional emissions budget test documented in this report and compliance with other requirements for conformity the Greensboro Urban Area 2030 Transportation Plan conforms to the purpose of the North Carolina SIP.** This report documents the regional emissions budget test, interagency consultation process, public involvement process, and analysis methodology used to demonstrate transportation conformity.

40 CFR Part 93 requires that a conforming transportation plan satisfy five conditions:

- ⇒ The transportation plan must be consistent with the motor vehicle emissions budget(s) in an area where the applicable implementation plan submissions contains a budget (40 CFR Part 93.118),
- ⇒ The transportation plan, TIP or FHWA/FTA project not from a conforming plan must provide for the timely implementation of TCMs from the applicable implementation plan (40 CFR Part 93.113b),
- ⇒ The MPO must make the conformity determination according to the consultation procedures of 40 CFR Part 93.105l and the implementation plan revision required by l40 CFR Part 93.390 (40 CFR Part 416),
- ⇒ The conformity determination must be based on the latest emissions estimation model available (40 CFR Part 93.111),
- ⇒ The conformity determination must be based on the latest planning assumptions (40 CFR Part 93.110).

The Greensboro Urban Area transportation plan meets each of these conditions as summarized in Table 1. Each condition is discussed in greater detail in the following sections of the report.



## 2. Air Quality Planning

Guilford County was originally declared non-attainment for ozone on January 6, 1992. Subsequently Guilford County was redesignated to maintenance for ozone on November 8, 1993. The redesignation was based on monitoring data from 1989 through 1992 and a demonstration of maintenance of the standard until 2004. The maintenance plan updates includes emissions budgets for 2004, 2007, 2010, 2012 and 2015. This report includes the USEPA direct final rule for ozone in Appendix A.

### *2.1. Emissions Budgets*

The North Carolina Department of Environment and Natural Resources prepared emissions budgets at the county level for their maintenance demonstration for the Triad. These county level budgets, as well as the Federal Register notice of redesignation, are included in Appendix A.

**Table 3: Daily Volatile Organic Compounds Budget**

| Year | Davidson | | Guilford | | Total | |
|---|---|---|---|---|---|---|
| | TPD | KG/D | TPD | KG/D | TPD | KG/D |
| **2004(Old SIP)** | 8.07 | 7,321 | 24.57 | 22,290 | 32.64 | 29,611 |
| **2004** | 6.49 | 5,888 | 20.21 | 18,334 | 26.70 | 24,222 |
| 2007 | 5.77 | 5,234 | 17.55 | 15,921 | 23.32 | 21,156 |
| **2010** | 4.73 | 4,291 | 14.32 | 12,991 | 19.05 | 17,282 |
| 2012 | 4.38 | 3,973 | 13.10 | 11,884 | 17.48 | 15,858 |
| **2014** | 4.38 | 3,973 | 13.10 | 11,884 | 17.48 | 15,858 |
| 2015 | 3.94 | 3,574 | 11.66 | 10,578 | 15.60 | 14,152 |
| **2020** | 3.94 | 3,574 | 11.66 | 10,578 | 15.60 | 14,152 |
| **2030** | 3.94 | 3,574 | 11.66 | 10,578 | 15.60 | 14,152 |

**Table 4: Daily $NO_X$ Budget**

| Year | Davidson | | Guilford | | Total | |
|---|---|---|---|---|---|---|
| | TPD | KG/D | TPD | KG/D | TPD | KG/D |
| **2004(Old SIP)** | **12.24** | 11,104 | **41.26** | 37,430 | 53.50 | 48,534 |
| **2004** | 12.78 | 11,594 | 34.03 | 30,871 | 46.81 | 42,465 |
| 2007 | 10.49 | 9,516 | 27.28 | 24,748 | 37.77 | 34,264 |
| **2010** | 7.79 | 7,067 | 20.11 | 18,243 | 27.90 | 25,310 |
| 2012 | 6.36 | 5,770 | 16.44 | 14,914 | 22.80 | 20,684 |
| **2014** | 6.36 | 5,770 | 16.44 | 14,914 | 22.80 | 20,684 |
| 2015 | 4.72 | 4,282 | 12.18 | 11,050 | 16.90 | 15,331 |
| **2020** | 4.72 | 4,282 | 12.18 | 11,050 | 16.90 | 15,331 |
| **2030** | 4.72 | 4,282 | 12.18 | 11,050 | 16.90 | 15,331 |

The analysis documented in this report applies to the Greensboro and High Point Metropolitan Planning Organizations. The emissions budgets used in this analysis are for Guilford County and Davidson County North Carolina. The emissions analysis accounts for transportation projects from both the Greensboro, High Point and Burlington-Graham Long Range Transportation Plan. This report specifically applies to the Greensboro Long Range Transportation Plan. The emissions budgets used in the comparison are the sum of the Guilford County Emissions budget and entire Davidson County Emissions budget.



# 3. Long Range Transportation Plan

The 2030 Long Range Transportation Plan for Greensboro Urban Area is an update of the previous long-range transportation plan for Greensboro Urban Area. The socioeconomic data and fiscal constraint elements of this LRTP include forecasts to 2030. The Greensboro Urban Area approved the socioeconomic estimates on August 25, 1999, with interim adjustments performed in February of 2003, to more accurately reflect development that had occurred or been approved since the original 1994 data collection and forecasts. New and rigorous cost estimation and revenue forecasts were prepared for the revised LRTP, to insure it is fiscally constrained.

## *3.1. Consultation*

This report was reviewed by NCDENR as specified in the North Carolina Administrative Code (NCAC Title 15A Subchapter 2D Sections .2001 - .2005 inclusive). NCDENR submitted comments on the draft version of the conformity report. These comments were incorporated into the final report. The NCDENR comments and any to them are included in Appendix G.

The conformity analysis documented in this report was the subject of interagency consultation as described in the draft Greensboro Memorandum of Agreement for Interagency Consultation. An initial interagency consultation meeting for this analysis was held in Greensboro, North Carolina on December 4, 2003. Representatives of the Greensboro MPO, High Point MPO, Winston-Salem MPO, Piedmont Triad RPO, NCDOT, NCDENR, EPA, and FHWA were physically present at the meeting.

## *3.2. Financial Constraint*

The Greensboro Urban Area Long Range Transportation Plan is fiscally constrained to the year 2030. All projects included in the current 2004-2010 TIP are fiscally constrained and funding sources have been identified for construction and operation. The estimates of available funds are based on historic funding availability and include federal, state, and local funding sources. The transportation networks assumed in each analysis year are balanced with available funds. These transportation networks are described in the Greensboro Urban Area Long Range Transportation Plan.

## *3.3. Latest Planning Assumptions*

The 2030 Greensboro Urban Area transportation plan was developed with the latest planning assumptions as discussed in 40 CFR Part 93.110. Population and employment were initially developed for 1994 based on a "windshield" survey of the planning area. With the release of the 2000 census, however, it was discovered that the previous forecasts substantially underestimated the growth in the area. To compensate, the census data, together with employment data collected from InfoUSA, were used to update socio-economic data for 2000. Population, household, and employment forecasts for 2014 and 2025 were revised to be consistent with these observed differences in development and growth trends. These forecasts reflect a combination of the

original Existing Trends Land Use Scenario and more recent estimates published by the North Carolina State Data Center.

Trip productions and attractions (as well as the through trip table) for the current (2004) LRTP update were derived by interpolation between the 2000 and 2014 data described above. Future year data are derived from these updated forecasts as well. The 2014 population and employment are unchanged from the updated forecast, other than to reflect significant unanticipated growth associated with the recently-approved Reedy Fork Ranch development along US 29 north. The 2020 values were linearly interpolated from the 2014 and 2025 forecasts described above, with the addition of the Reedy Fork growth. The 2030 values were extrapolated using the same growth rates developed in the update process.

The Greensboro Urban Area travel demand model is based on the four-step modeling process: trip generation, trip distribution, mode choice, and trip assignment.

Mode choice, which predicts the amount of travel that will be made by each mode of transportation, was not developed for the Triad Regional Model. Existing ridership levels in the Piedmont Triad were considered too low to warrant development of a predictive mode split model. Instead, the transit model follows the same methodology as the highway model. Although this is not a predictive model, it represents the distribution of a target ridership, expansion of existing routes, addition of new routes, potential captive ridership areas, and the resulting impacts on existing and proposed roadway systems. Transit trip generation was restricted to zones adjacent transit routes. Ridership information for each route was collected from each MPO for validation and calibration purposes.

The trip generation and trip distribution models were calibrated using the TRIAD origin destination survey conducted in 1994. The network assignment and transit assignment were validated using traffic counts and transit ridership counts for 1994. Traffic assignment was re-validated to 2002 counts using a 2002 interpolated model assignment, obtained in the same manner described above.

There are no court orders or special agreements that apply to conformity in the Greensboro Urban Area (40 CFR Part 93.109).

### 3.4. *Future Year Roadway Networks*

The future year roadway networks used in the conformity analysis were developed as part of the recent update to the Greensboro Urban Area Long Range Transportation Plan. Local staff, together with the state and outside consultants developed a plan to address the future transportation needs of the area. These recommendations underwent public comment, and are financially constrained. Estimated project costs were balanced against anticipated revenue streams to identify a likely and feasible street network for each analysis year.

### 3.5. *Future Transit Networks*

The base transit network (1994) was modeled assuming existing 1994 transit routes and ridership. Analysis for the future year (2025) concludes total transit ridership to be 1.7% of vehicle trips (converted to person trips). The 2025 transit analysis assumes continuation of existing transit routes without significant expansion of regional routes. The expansion of regional routes will be addressed in the new Triad Regional Model analysis that is now under analysis. The major hubs in the Triad Region are proposed to be the Winston-Salem Transit Center, Greensboro Multi-Modal Center, High Point Transit Center and Triad Airport.

The future year ridership is based on the Trend Land-Use projections not to exceed 1.7% of total vehicle trips (converted to person trips). Total estimated daily ridership for the Triad Region is 69,000 riders for the design year 2025. It is assumed that the continuation of historical growth

patterns will continue to support existing routes, but will not be conductive to significant expansions in regional service.

As required in 40 CFR 93.106, all transit projects in the future (2014, 2020 and 2030) are fiscally constrained.



### 3.6. Trip Generation

Trip generation is performed using the NCDOT's Internal Data Summary (IDS) program. IDS is a regression type trip generation model that estimates trip productions using five housing classifications per analysis zone and one trip rate per housing classification. The household classifications are determined during a "windshield" survey of the planning area. The windshield survey includes a 100 percent look at the dwelling units within the planning area. Trip attractions are estimated based on the number and type of employees in an analysis zone and the number of commercial vehicles garaged in the analysis zone.

The Triad Regional Travel Demand Model uses eight trip purposes: rural home-based work, urban home-based work, rural other home-based, urban other home-based, nonhome-based, external-internal, truck, and external-external or through trips. Productions and attractions are individually constrained with productions balanced to match attractions by both IDS and later in the gravity model.

### 3.7. Trip Distribution

The Triad Regional Travel Model uses a standard gravity model to distribute trips. The model builds zone to zone trip tables (by purpose) using a weighted sum of travel time and distance. For assignment purposes the individual trip tables are aggregated into a single trip table for each analysis year (2004, 2014, 2020 and 2030).

### 3.8 Mode Choice and Transit Assignment

The transit model is an essential part of long-range transportation planning for the Greensboro 2030 Transportation Plan. The transit model was developed based on existing transit routes and ridership. The TAZ's adjacent to the transit routes were identified and analyzed with regards to lower income housing and employment opportunities. The base year (1994) transit model was then tested for accuracy, loaded and calibrated to within 100 person-trips of the actual route ridership.

Future year transit routes are described briefly in Section 3.5 above. The future year transit system includes high speed, high capacity transit service mostly on exclusive right-of-way, with some in-traffic operation in the Central Business Districts. The future year transit network will include additional bus service to support the high speed, high capacity transit system and to operate in the area between the high demand corridors. These buses operate on the streets with travel time dependent on the network speeds from the model. The Transit system will be addressed in the new Triad Regional Model analysis that is now under analysis.

### 3.9 Highway Assignment and Vehicle Miles Traveled

The Triad Regional Travel Model uses an equilibrium assignment method. This method assigns vehicle trips based on equalizing the capacity on the network links. After the vehicle trips are assigned, the fiscally constrained networks are used as input into Truespeed. Truespeed is a post processor that calculates link travel speeds based on assigned traffic volume, number of through lanes, and number of signals per mile. Truespeed is based on Chapters 3 and 11 of *The Highway Capacity Manual*. The vehicle miles traveled (VMT) and travel speeds used for this conformity analysis were calculated and aggregated by functional classification during the Truespeed run.

Table 5 displays Summary Statistics for the Triad Regional Travel Model for both the Greensboro and High Point urban areas.

**Table 5: Model Summary Statistics**

| Horizon Year | Guilford County VMT | Population | Employment |
|---|---|---|---|
| 2004 | 14,850,060 | 406,603 | 272,481 |
| 2010 | 16,404,997 | 443,781 | 268,202 |
| 2014 | 17,441,622 | 482,837 | 305,200 |
| 2020 | 20,052,415 | 520,147 | 328,190 |
| 2030 | 23,234,079 | 585,437 | 368,897 |

## 4. Regional Emissions Budget Test

In areas with an USEPA approved attainment demonstration of maintenance plan, an emissions budget comparison satisfies the emissions test requirement of 40 CFR Part 93.118. For pollutants for which an emissions budget has been approved, the estimated emissions from the transportation plan must be less than or equal to the emissions budget values. The results of the emissions analysis for each pollutant are shown in Table 5 (NOx) and Table 6 (VOC) below. NCDENR provided the emissions factors used in this analysis.

**Table 6: Daily NOx Emission Comparison**

| Guilford & Davidson Counties Emissions Comparison (kg/day) | | | | |
|---|---|---|---|---|
| | Guilford County $NO_X$ | | Davidson County $NO_X$ | |
| Year | SIP Emissions (KG/Day) | Long Range Plan Emissions (KG/Day) | SIP Emissions (KG/Day) | Long Range Plan Emissions (KG/Day) |
| **2004(Old SIP)** | 37,430 | 29,310 | 11,104 | 8,640 |
| **2004** | 30,871 | 29,202 | 11,594 | 8,649 |
| 2007 | 24,748 | 22,740 | 9,516 | 6,775 |
| **2010** | 18,243 | 16,277 | 7,067 | 4,901 |
| 2012 | 14,914 | 13,404 | 5,770 | 4,018 |
| **2014** | 14,914 | 10,531 | 5,770 | 3,136 |
| 2015 | 11,050 | 9,874 | 4,282 | 2,915 |
| **2020** | 11,050 | 6,593 | 4,282 | 1,810 |
| **2030** | 11,050 | 5,047 | 4,282 | 1,297 |

**Table 7: Daily VOC Emission Comparison**

| Guilford & Davidson Counties Emissions Comparison (kg/day) | | | | |
|---|---|---|---|---|
| | Guilford County VOC | | Davidson County VOC | |
| Year | SIP Emissions | Long Range Plan Emissions | SIP Emissions | Long Range Plan Emissions |
| **2004(Old SIP)** | 22,290 | 17,434 | 7,321 | 4,524 |
| **2004** | 18,334 | 16,737 | 5,888 | 4,385 |
| 2007 | 15,921 | 13,890 | 5,234 | 3,592 |
| **2010** | 12,991 | 11,044 | 4,291 | 2,798 |
| 2012 | 11,884 | 9,819 | 3,973 | 2,511 |
| **2014** | 11,884 | 8,594 | 3,973 | 2,224 |
| 2015 | 10,578 | 8,273 | 3,574 | 2,137 |
| **2020** | 10,578 | 6,668 | 3,574 | 1,701 |
| **2030** | 10,578 | 5,700 | 3,574 | 1,486 |

### *4.1. Emissions Model*

NCDENR used MOBILE 6.2 to develop the emissions factors. Motor vehicle emissions controls considered in the MOBILE model are an inspections and maintenance program (as required in the North Carolina SIP). Area specific information such as vehicle age distribution and vehicle type distribution was used rather than national default values.

#### 4.1.1. Development of Emissions Factors

A critical element of any emissions analysis is the development and utilization of the emissions factors applied to the travel estimates. In order to assure that the emissions factors used in the conformity analysis were compatible with those used in the development of the North Carolina SIP, NCDENR provides emission factors and model inputs for each maintenance area in North Carolina. The Mobile 6.2 emissions factor model was used to develop the emissions factors in April 2004. The MOBILE 6 input files for this effort are included in Appendix C.

NCDENR provides motor vehicle emissions factors by federal functional classification. In addition the percentage of motor vehicles subject to the inspection and maintenance program is estimated from accident data. The scope of North Carolina's motor vehicle inspection and maintenance program is set to expand from nine counties to forty-eight counties by 2007. The phase of the I&M program is reflected in Table 8.

**Table 8: Percent of Vehicles Subject to I&M in Guilford and Davidson Counties**

| County | 2004 | <2030 |
|---|---|---|
| Guilford | 81 | 96 |
| Davidson | 89 | 96 |

#### 4.1.2. Development of VMT mix for Mobile6 model:

The North Carolina Department of Transportation (NCDOT) provides data on VMT for six urban and six rural road types; vehicle mix data are available for the same road types. Automatic traffic recording stations and selected Highway Performance Monitoring System (HPMS) locations were used and counts taken throughout 1999 - 2001are used to determine the percentage of vehicles, by vehicle type, for various road types. Vehicle classification data was used in conjunction with

Mobile6 default vehicle mix to estimate fleet distribution by functional class. The classification data was iteratively adjusted to replicate Mobile6's national classification default within the analysis area. The final numbers reflect the change in the mix (i.e. increase in the number of SUVs and pick-ups) for each year using Mobile6 projection and variation of mix across the different road type using NC data. This reflects 16 vehicle classes per road type.



### 4.1.3. Vehicle Age Distributions

The vehicle age distribution is based on the North Carolina Department of Motor Vehicles' (DMV) registration records for the in-use fleet, in the Triad area, which includes Davidson County. DMV provided the information in calendar 2000 for model years 1974 to 2000. The data was modified and arranged to comply with Mobile6.2

## *4.2. Off-Model Analysis*

A number of projects in this urban area fall outside the scope of traditional travel demand modeling. Their effect on emissions is accounted for by off-model calculations. FHWA Region IV's *Off-Model Air Quality Analysis: A Compendium of Practice* provided guidance on estimating emissions effects of these projects. The effects of these projects are included in the final conformity number shown in Table 2. All projects requiring off-model analysis are listed in Table 9.

The Greensboro Urban Area Long Transportation Plan will contain additional documentation on transit and paratransit improvements. The plan accounts for the continuation of exisiting transit, vanpool, and ridership programs. The Piedmont Authority of Regional Transportation (PART) is responsible for vanpool and ridership programs in the Triad region, which includes Burlington, Greensboro, and Winston-Salem. Greensboro's local transit authority, GTA (Greensboro Transit Authority), administers the local transit program. Current funding levels are as follows: $6,649,000 for capital expenses, and $9,872,555 for operating expenses.

### 4.2.1. Transit Improvements

In order to calculate the daily VMT reduction attributable to transit, the average trip length was multiplied by the total number of vehicles removed from the system. The vehicles removed from the system were determined by dividing the estimated ridership by the average vehicle occupancy rate (VOR). The average VOR was assumed to be 1.31 persons per vehicle. This estimate assumes a 1.46 percent annual growth rate for transit riders and an average transit trip length gradually from nine miles per rider to ten miles per rider.

As noted in section 3.5, transit ridership makes up 1.7% of total trips.

### 4.2.2. Vanpool

In order to calculate the daily VMT reduction attributable to vanpools, the average round trip commute length per vehicle was multiplied by the total number of vehicles removed from the system. The vehicles removed from the system were determined by dividing the estimated ridership by the average vehicle occupancy rate (VOR). The average VOR was assumed to be 1.35 persons per vehicle. Total ridership was estimated by assuming 5.5 vanpools beginning in 2004 and increasing to 57.5 in 2030, with an average of 12 riders per van. The average trip length for a Vanpool rider is assumed to range from nine to ten miles depending upon the year of the analysis.

### 4.2.3. ITS

Table 9 lists the projects that required off-model calculations. For all these projects, it was assumed that incident detection and response has 50% effectiveness. It was assumed that emissions caused by nonrecurring congestion accounts for 4.9% of total emissions. The incident management system is assumed to affect only the freeway and is expected to encompass nearly the entire freeway system in 2020 and 2030.

**Table 9: Projects Requiring Off-Model Calculations of Emissions by Off-Model Analysis**

| TIP No. or Responsible Agency | Description | First Analysis Year |
|---|---|---|
| Piedmont Authority for Regional Transportation (PART) | Continuation of existing vanpool and ridership programs | 2004 |
| HiTRan (High Point Transit) | Continuation of existing transit program | 2004 |
| Greensboro Transit Authority (GTA) | Continuation of existing transit program | 2004 |
| I-2201F | Freeway Surveillance Associated with this Project | 2004 |
| I-2402 | Freeway Surveillance Associated with this Project | 2004 |
| R-0609 | Freeway Surveillance Associated with this Project | 2014 |
| R-0984 | Freeway Surveillance Associated with this Project | 2004 |
| U-2524 | Freeway Surveillance Associated with this Project | 2014 |
| U-2525A | Freeway Surveillance Associated with this Project | 2004 |
| U-2525B | Freeway Surveillance Associated with this Project | 2014 |
| U-2525C | Freeway Surveillance Associated with this Project | 2020 |
| TIP - unfunded | Freeway Surveillance Associated with this Project (I-85 - Elon College Exit to NC 6) | 2014 |
| TIP - unfunded | Freeway Surveillance Associated with this Project (I-85 - NC 6 to US 220) | 2014 |
| TIP - unfunded | Freeway Surveillance Associated with this Project (I-40 - I-85 to High Point Road) | 2014 |
| TIP - unfunded | Freeway Surveillance Associated with this Project (US 220 - I-40 to US 70) | 2014 |
| TIP - unfunded | Freeway Surveillance Associated with this Project (I-85 Business -Split to Guilford/Randolph Line) | 2020 |
| TIP - unfunded | Freeway Surveillance Associated with this Project (US 220 - I-40 to Guilford/Randolph Line) | 2020 |
| TIP - unfunded | Freeway Surveillance Associated with this Project (US 220 - Loop to NC 68) | 2020 |
| TIP - unfunded | Freeway Surveillance Associated with this Project (US 421 - I-85/I-40 to Guildford/Randolph Line) | 2020 |
| R-2606 | Freeway Surveillance Associated with this Project | 2014 |

### 4.2.4. Park and Ride

In order to calculate the daily VMT reduction attributable to park and ride facilities, the average round trip commute length per vehicle was multiplied by the total number of vehicles removed from the system. The vehicles removed from the system were determined by multiplying the

number of spaces in the lot by the estimated utilization, which was assumed at 90%. This calculation assumes a park and ride system growing from zero in 1994 to 2000 spaces in 2020 and remaining constant thereafter. Average trip length for the park and ride system is assumed to be between five and six miles per user.



### 4.3. Analysis Outside the Modeled Area

The Triad Regional Model covers all of Guilford County. All projects in the Greensboro Long Range Transportation Plan are included in the Triad Regional Model.

### 4.4. Budget Test By Pollutant

The Greensboro Urban Area is a maintenance area only for ozone. USEPA approved the SIP re-designating Guilford and Davidson Counties to maintenance for ozone on November 8, 1993. The Federal Register notice containing the summary emissions budget is included in Appendix A. In addition the actual pages from the maintenance plan detailing the emissions budget are included in Appendix A. Ozone has two precursors oxides of nitrogen (NOX) and volatile organic compounds (VOC). Section 4.6.1 documents the emissions budget comparison for NOX. Section 4.6.2 documents the emissions budget comparison for VOCs.

That original maintenance plan included emissions budgets for 1999, 2002, and 2004. 40 CFR Part 93. 106 requires that transportation emissions be estimated at, minimum, ten year intervals beginning with the base year of the travel demand model. For this analysis travel model runs were made for 2004, 2014, 2020, and 2030. Emissions for 2007,2012 and 2015 are interpolated. The maintenance plan update includes emissions budgets for 2004, 2007, 2010, 2012 and 2015. 40 CFR Part 93. 106 requires that transportation emissions be estimated at, minimum, ten year intervals beginning with the base year of the travel demand model.

## 5. Public Involvement and Interagency Consultation

Public review of this report was handled in accordance with the Greensboro Urban Area public participation policy for Transportation Plans. A copy of the public participation policy is included in Appendix H. Comments from the public participation process are incorporated into the final Conformity Analysis and Determination Report. Those comments that are written are included in Appendix I of the final report.

## 6. Conclusion

Based on the analysis and consultation discussed above the proposed 2030 Greensboro Urban Area transportation plan conforms to the purpose of the North Carolina State Implementation Plan. In every analysis year for every pollutant, the emissions expected from the implementation of the long range plan are less than the emissions budget for Guilford and Davidson Counties approved in the Maintenance Plan.

# Appendix A: Federal Register SIP Notice and Emissions Budgets

# Appendix B: Discussion of Emissions Factor Development

## Emission Factor Estimation Procedure for SIP[4]

The North Carolina Division of Air Quality calculated the required mobile source emission factors using MOBILE 5a. The MOBILE model has been upgraded by the U.S. Environmental Protection Agency (EPA) to MOBILE 5b; however, the original budget included in the TRIAD redesignation package was calculated using MOBILE 5a. Therefore to ensure consistency, MOBILE 5a was used throughout this analysis. Data inputs (vehicle mix, vehicle age distribution, temperatures, speed by functional class, and information on control programs currently in place) were collected from a variety of sources including the EPA, NCDOT, and other relevant State agencies.

## Emissions Budgets for SIP

The emissions budgets for carbon monoxide (CO), volatile organic compounds (VOC), and oxides of nitrogen ($NO_X$) were developed as part of the maintenance demonstration for the Triad nonattainment area. The $NO_X$ and VOC emissions budgets were calculated on an episode day basis. These budgets set the limits for motor vehicle emissions to help the area to maintain the public health standards for ten years through 2004. The maintenance plan containing the mobile emission budgets was adopted by the state and approved by EPA into the official State Implementation Plan. The maintenance plan was deemed acceptable for protecting the public health through 2005.

Mobile 5a was used to generate VOC, $NO_X$ and CO emission factors for each vehicle class and road type. Using a spreadsheet, daily vehicle miles traveled (DVMT) for the summer season were divided by seasonal adjustment factors and then the inspection and maintenance (I/M) and non-I/M fractions were multiplied by the I/M and non-I/M scenario emissions in the spreadsheet to calculate CO, VOC, and $NO_X$ emissions. These emissions were calculated for the base year and each of the projection years on a tons per day basis for the TRIAD counties.

Please refer to the Greensboro/Winston-Salem/High Point Redesignation Package - Mobile Source Emission Estimation for further details of the inputs and calculation methodologies.

[4] Prepared by the North Carolina Department of Environment and Natural Resources